

# Thermal and Statistical Physics I

CLASS DATE		TOPICS	HOMEWORK DUE DATES	CALLEN READINGS (READ AHEAD)
JAN	13	<b>INTRODUCTORY COMMENTS, COURSE OUTLINE</b>		
	15	THE FOUR POSTULATES:		1.1-6
	17	THE BASIC PROBLEM OF THERMODYNAMICS		1.7-10
	20	<i>MARTIN LUTHER KING DAY – NO CLASS</i>		
	22	CONDITIONS OF EQUILIBRIUM: EQUATIONS OF STATE		2.1-3
	24	KINDS OF EQUILIBRIUM (MECHANICAL, THERMAL, CHEMICAL)		2.4-9
	27	FORMAL RELATIONS; IDEAL GAS		3.1-4
	29	VAN DER WAALS FLUID, ELECTROMAGNETIC RADIATION, RUBBER BAND	1: CHAP 1-2	3.5-7
	31	MAGNETIC SYSTEMS, HEAT CAPACITY AND OTHER DERIVS		3.8-9
FEB	3	REVERSIBLE PROCESSES: HEAT ENGINES		4.1-4
	5	MAXIMUM WORK THEOREM, CARNOT AND OTHER THERMODYNAMIC CYCLES	2: CHAP 3	4.5-10
	7	ALTERNATE FORMULATIONS VIA LEGENDRE TRANSFORMATIONS		5.1-2
	10	<b>EXAM, CHAPTERS 1-3 ( 7-9 PM, REVIEW DURING CLASS)</b>	EXAM 1	
	12	THERMODYNAMIC POTENTIALS		5.3-4
	14	HELMHOLTZ, GIBBS POTENTIALS, CHEMICAL REACTIONS		6.1-4
	17	<i>PRESIDENT'S DAY -- NO CLASS</i>		
	19	ENTHALPY		6.5-7
	21	MAXWELL RELATIONS		7.1-3
	24	APPLICATIONS OF MAXWELL RELATIONS	3: CHAP 4-6	7.4-5
	26	STATISTICAL MECHANICS IN MICROCANONICAL FORMALISM: ENTROPY, SIMPLE MODELS		15.1-3
	28	POLYMER MODEL, HIGH DIMENSIONALITY		15.4-5
MAR	3	STABILITY OF SYSTEMS AND CONSTRAINTS ON THEIR THERMODYNAMIC PROPERTIES		8
	5	FIRST-ORDER PHASE TRANSITIONS	4: CHAP 7,15	9.1-3
	7	GIBBS PHASE RULE		9.4-6
	10	<b>EXAM, CHAPTERS 4-7 AND 15 ( 7-9 PM, REVIEW DURING CLASS)</b>	EXAM 2	
	12	PHASE DIAGRAMS OF BINARY SYSTEMS (TEMP., PRESSURE, MOLE FRACTION)		9.7
	14	CRITICAL PHENOMENA; ORDER PARAMETERS		10.1-3
	17-21	<i>SPRING BREAK</i>		
	24	LANDAU THEORY; SCALING AND UNIVERSALITY OF CRITICAL BEHAVIOR		10.4-6
	26	NERNST POSTULATE: UNATTAINABILITY OF ABSOLUTE ZERO		11
	28	SUMMING UP OF THE PRINCIPLES OF THERMODYNAMICS	5: CHAP 8-10	12
	31	PROPERTIES OF MATERIALS: REACTIONS IN IDEAL GASES		13.1-2
APR	2	DILUTE SOLUTIONS		13.3-6
	4	CANONICAL FORMALISM: STATISTICAL MECHANICS IN HELMHOLTZ REPRESENTATION		16.1-4
	7	DENSITY OF STATES	6:CHAP 11-13	16.5-7
	9	ELECTROMAGNETIC RADIATION; CLASSICAL IDEAL GAS		16.8-11
	11	ENTROPY AND DISORDER: GRAND CANONICAL FORMULATION		17
	14	<b>EXAM, CHAPTERS 8-13 ( 7-9 PM, REVIEW DURING CLASS)</b>	EXAM 3	
	16	QUANTUM FLUIDS: FERMIONS, ELECTRONS IN A METAL		18.1-4
	18	BOSONS	7:CHAP 16-17	18.5-7
	21	FLUCTUATIONS		19
	23	BOGOLIUBOV VARIATIONAL THEOREM; MEAN FIELD THEORY		20
	25	IRREVERSIBLE THERMODYNAMICS	8:CHAP 18-19	14
	28	SYMMETRY AND FOUNDATIONS OF THERMOSTATISTICS		21
	30	TO BE ANNOUNCED		
MAY	2	WRAPUP		
<b>MAY</b>	<b>8</b>	<b>FINAL EXAM (THURSDAY, MAY 8, 7-10 AM WITH UNIVERSAL CONSENT )</b>	FINAL EXAM	

Text: Callen, *Thermodynamics and an Introduction to Thermostatistics*, (Wiley, 2<sup>nd</sup> ed., 1985)

Exams will be on Monday evenings from 7-9 pm, with the class period that day used for review.

This schedule is tentative and subject to changes and/or correction without notice.